

Integrative analysis of the Paleocene-Eocene Mortemer Formation in the Sotteville-sur-Mer section of Upper Normandy, France

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Several outcrops recording the Paleocene-Eocene boundary are scattered along the Upper Normandy coast. The well-exposed sections can be considered as reference sections for the NW European continental-shallow marine P/E deposits. However, European terrestrial vertebrate sites of the Upper Paleocene - Lower Eocene deposits are predominantly known from the central and eastern parts of the Paris Basin. Here we report the discovery of a new terrestrial vertebrate site in the Mortemer Formation, at the top of the cliffs of Sotteville-sur-Mer in Upper Normandy, France.

The Paleocene-Eocene deposits that belong to the Mont Bernon Group are exposed on more than 7m in thickness and overly the Campanian chalk. From the base to the top of the measured section, four main members are delineated following the new lithostratigraphical classification of the "Sparnacian" in the Paris Basin (Aubry *et al.*, 2005): the Pays de Caux Member and the Calcaire d'Ailly Member that belong to the carbonate-rich continental Mortemer Formation, underlying the Sotteville-sur-Mer Member (new name) and the Craquelins Member that belong to the Soissonnais Formation.

We recognize the onset of the Paleocene-Eocene Carbon Isotope Excursion (CIE) evidenced on dispersed organic carbon (from -25.0‰ to -29.6‰) and corresponding to the P/E boundary in the unit 1 of the Calcaire d'Ailly Member. A diverse and rich charophyte flora is well represented throughout the lower part of the outcrop and allows to precise that the CIE falls into the *Peckichara disermas* biozone. Invertebrates are also present in this part of the section and correspond to a typical fresh water malacofauna

based on the abundant occurrence of the gastropod molluscs *Hydrobia* sp. and *Bithinella* sp. and by sphaeriid bivalves.

The vertebrate level is situated in the upper part of the unit 2 of the Calcaire d'Ailly Member and about 1.5 meter above the onset of the CIE and is therefore earliest Eocene in age. The vertebrate fauna is composed of fish, amphibians, lizards and mammals. Based on otoliths, fish are attributed to the percoid *Anthraco-perca* sp. and to the salmoniform *Thaumaturus* sp. Two different salamanders are recognised. One is here referred to cf. *Nothophthalmus* sp. and the other is similar to the genus *Salamandra*. The presence of frogs is attested by a typically anuran ischium and surangular. Scincomorph lizards are represented by fragments of dentaries, maxillaries and quadrate osteoderms whereas oval osteoderms with a central crest are attributed to anguimorph lizards. Numerous small crocodilian teeth are also present.

Finally, despite their small number, the remains referred to mammals represent a diversified fauna. Beside indeterminate claws and worn teeth, the site of Sotteville-sur-Mer delivered teeth of the oldest peradectid marsupials, attributed to the genus *Peradectes* and also the oldest paramomyid plesiadapiform in Europe. This latter could be attributed to *Ignacius* or *Arcius*. The mammal assemblage that also includes the erinaceomorph insectivore *Macrocranion* and typical ischyromyid rodents is best correlated with the reference-level MP7 of the mammalian biochronological scale for the European Paleogene (BiochroM'97, 1997).

The Sotteville-sur-Mer reference section thus documents a perfect example of the progressively marine influence from the base of the continental Mortemer Formation to the top of the brackish-lagoonal Soissonnais Formation in Upper Normandy. Moreover, the deposits have recorded the Paleocene-Eocene boundary, yielded earliest Eocene mammals, and allowed to demonstrate the importance of the *Peckichara disermas* biozone for this time interval.

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